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# HOW MUCH DOES THE LEFT MAIN BIFURCATION ANGLE CHANGE THROUGHOUT THE CARDIAC CYCLE? QUANTITATIVE IMPLICATIONS FOR LEFT MAIN BIFURCATION STENT DESIGNS

i2 Oral Contributions
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Session Title: Left Main and Bifurcation
Abstract Category: 1. CT/MRI - Angiography and Interventional Aspects
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**Background:** Unprotected left main (LM) stenting is now an accepted alternative to coronary bypass grafting. The LM bifurcation represents a novel design challenge for coronary stents as it supports more than 1 billion cardiac cycles over a 30-year period. The coronary arteries shift substantially during the systolic-to-diastolic phase transition, resulting in complex angle deformation through which an LM bifurcation stent must track. The 3-D motion and angular changes have not been quantified in living patients, but cardiac CTA (CCTA) now provides a method for accurately measuring this motion. We thus used CCTA in living patients to calculate the 3-D angle changes between the LM, left anterior descending (LAD), and left circumflex (LCx) arteries.

**Methods:** Fifty-one patients undergoing CCTA imaging for clinical indications were measured for LM-LAD, LM-LCx, and LAD-LCx angle changes from peak systole to diastole using commercial 3-D CTA software. Centerline coordinate points using fiducial locations and angles corresponding to specific phase changes were manually recorded and used for calculation.

**Results:** Though mean angle changes from systole to diastole between the LAD-LCx was 4.1 degrees, large differences between maximum and minimum values indicate a broad range for bifurcation angle changes across patients.

**Conclusions:** LM bifurcation geometry in 3-D shows that the LAD-LCx bifurcation is the most dynamic. These data may provide design information for future LM bifurcation stent designs.

| Bifurcation Location | Mean Angle change* (N=51) | Maximum Angular change | Minimum Angular change* | Mean Absolute Angle, Systole (+SD) | Mean Absolute Angle, Diastole (+SD) |
|---|---|---|---|---|---|
| LM-LAD | 0.022 | 43.5 | 0.2 | 146.55±15.14 | 146.52±15.24 |
| LM-LCx | 3.12 | 51.8 | 1.1 | 122.05±23 | 118.93±24.38 |
| LAD-LCx | 4.14 | 42.3 | 0.2 | 72.26±26.77 | 76.40±26.59 |